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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,848	09/06/2003	Ka-Ngo Leung	IB-1826A	8582

8076 7590 08/10/2005

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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 08/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/656,848

Applicant(s)

LEUNG ET AL.

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2003.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-12 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 06 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/04, 3/04, 9/04.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities:

Page 8, line 4: it is suggested to change "62" to "60".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4, 8, 11 are rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al (US patent No. 4,602,161)

Leung et al teach an apparatus (Figure 6 and Column 4, lines 20-35) that comprises:

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a source chamber 42;

an RF antenna 44 mounted external to the chamber;

an RF power source (not shown in the drawing) coupled to the RF antenna for generating a plasma containing positive ions in a gas in the source chamber;

Leung et al further teach that the apparatus can be used to form negative ions (Column 5, lines 50-55).

Leung et al do not teach about the converter for producing negative ions.

Whealton et al (US patent No. 4,602,161) teach an apparatus (as per Figure) that uses a converter plate 7 mounted in a plasma source, for generating negative ions by surface ionization of positive ions and that is negatively biased with reference to housing 9 (Column 2, lines 30-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use converter for generating negative ions as taught by Whealton et al in the apparatus of Leung et al to enable generate negative ion beam with low divergence (Column 1, lines 24-27).

Regarding Claim 4: Leung et al teach that the plasma generated in the source chamber is an argon ion plasma (Column 4, lines 27-30).

Regarding Claim 8: Leung et al teach (Column 4, line 66 to Column 5, lines 1-5) that the source chamber 42 further comprises:

an extraction aperture 62;

a pair of spaced extraction electrodes 64, 66 (Figure 8) mounted at the aperture.

Regarding Claim 11: Whealton et al teach that the converter 7 has a spherical surface such that the configuration of electrodes and relative spacing produces a focused negative ion beam at exit slit 31 (Column 3, lines 5-30).

Claim 3 is rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al (US Patent No. 4,602,161) as applied to claim 1 and further in view of Shindo et al (US Patent No. 6,511,575).

Leung et al in view of Whealton et al teach all limitations of the claim except for material of the converter. Whealton et al further teach cesium as the converter surface 7 to generate negative ions (Column 2, lines 60-67).

Shindo et al teach an apparatus (Figure 11) that uses a negative ion generation conversion portion (converter) 47 made from group of compounds including Lanthanum Hexaboride, LaB.sub.6 (Column 14, lines 53-68 and Column 15, lines 1-6).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use converter made from lanthanum hexaboride (LaB.sub.6) instead of using cesium layer to generate negative ions in the apparatus of Leung et al in view of Whealton et al (Column 14, lines 40-65).

Claim 5 is rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al (US Patent No. 4,602, 161) as applied to claim 1 and further in view of Hashimoto (JP2000133497A)).

Leung et al in view of Whealton et al teach all limitations of the claim except for shield.

Kiyoshi teaches an apparatus (Figure 1) that uses a cylindrical shield 29 mounted inside chamber wall 2 (Paragraph 0030) to improve reliability of operation (Paragraph 0037).

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Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a shield as taught by Hashimoto in the apparatus of Leung et al in view of Whealton et al to improve reliability of operation of the equipment.

Claim 6 is rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al (US Patent No. 4,602,161) and Hashimoto (JP2000133497A) as applied to claims 1, 5 and further in view of Forster et al (US Patent No. 5,763,851).

Leung et al in view of Whealton et al and Hashimoto teach all limitations of the claim except for slots in the shield.

Forster et al teach an apparatus (Figure 5) that has an inner shield 350 having a plurality of slots 352 extending the length of the shield (Column 8, lines 21-30) to enable RF energy generated by coil to couple with plasma in the chamber (Column 2, lines 5-10).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have slots in the shield as taught by Forester et al in the apparatus of Leung et al in view of Whealton et al and Hashimoto to enable RF energy generated by coil to couple with plasma in the chamber.

Claim 7 is rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al (US Patent No. 4,602, 161) as applied to claim 1 and further in view of Chu et al (US Patent No. 6,228,176).

Leung et al in view of Whealton et al teach all limitations of the claim except for material of the RF antenna.

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Chu et al teach an apparatus (Figure 1, 8) that uses RF antenna 46 made of copper tubing (Column 8, lines 14-17) to improve implantation uniformity across the substrate (Column 3, lines 15-20).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use RF antenna made from copper tubing as taught by Chu et al in the apparatus of Leung et al in view of Whealton et al to improve implantation uniformity across the substrate.

Claims 2, 9, 10 are rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al as applied to Claims 1, 8 and further in view of Leung et al (US Patent No. 5,198,677).

Regarding Claim 2: Leung et al (US Patent No. 6,768,120) in view of Whealton et al teach that chamber is made of quartz but do not teach end plates (Column 4, lines 20-25).

Leung et al (US Patent No. 5,198,677) teach an apparatus (Figure 1) that uses mounting plates 31 for mounting the source chamber 11 (Column 3, lines 30-40).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use end plates as taught by Leung et al (US Patent No. 5,198,677) in the apparatus of Leung et al (US Patent No. 6,768,120) in view of Whealton et al for mounting the source chamber.

Regarding Claims 9, 10: Leung et al (US Patent No. 5,198,677) teach an apparatus (Figure 1) that uses a magnetic filter reference numbers 21, 211 mounted at the

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extraction aperture to reduce extracted electron current, to generate a beam having high current density. Leung et al further teach that magnetic filter comprises of a pair of spaced electron separator magnets 21; 22 positioned after the extraction electrodes to deflect electrons (Column 3, lines 30-45).

Claim 12 is rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of Whealton et al (US Patent No. 4,602,161) as applied to Claim 1 and further in view of admitted prior art and Shindo et al (US Patent No. 6,511,575).

Leung et al teach all limitations of the claim except operating parameters.

As regards converter bias, admitted prior art teaches converter bias voltage range from 0.5 to 1.0 kV (Page 2, line 17).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use operating parameter like converter bias voltage as taught by admitted prior art.

Power and gas pressure pertain to operating parameters and are considered as process limitations. Apparatus of prior art as disclosed is capable of being operated under conditions recited in the claim.

It has been held by courts (case law) that:

“A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).”

“Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Apparatus claims cover what a device is, not what a device does *Hewlett-Packard Co. V.*

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Bausch & Lomb Inc., 15USPQ2d 1525, 1528 (Fed. Cir. 1990)".

It is further noticed that Leung et al (US Patent No. 6,768,120) discloses (Figure 7) plasma source operating at 300 W, and also considers 250 W as modest power, indicating that the apparatus can operate at higher power level up to 800 W (Column 4, lines 50-55).

As regards gas pressure, Leung et al do not explicitly teach gas pressure, even though plasma ion sources with magnetic filter normally operate under low pressure. Gas pressure of 8-10 mTorr is considered as process limitation.

It has been held by courts (case law) that:

"It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980)."

"It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as [spray droplet size] through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990)."

"Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)."

Further Shindo et al teach an apparatus (Figures 1, 11) that uses a pressure range of 1 Pa to 7 Pa (7.5 mTorr to 52 mTorr) which includes the pressure range of 8-10 mTorr, for processing wafers to suppress damage due to charging (Column 7, lines 1-5 and Column 3, lines 15-18).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the gas pressure as per process limitations.

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Claims 1, 4, 8 are rejected under U.S.C. 103(a) as being unpatentable over Leung et al (US Patent No. 6,768,120) in view of admitted prior art.

Leung et al teach an apparatus (Figure 6 and Column 4, lines 20-35) that comprises:

a source chamber 42;

a RF antenna 44 mounted external to the chamber;

a RF power source (not shown in the drawing) coupled to the RF antenna for generating a plasma containing positive ions in a gas in the source chamber;

Leung et al further teach that the apparatus can be used to form negative ions (Column 5, lines 50-55).

Leung et al do not teach about the converter for producing negative ions.

Admitted prior art teach an apparatus that uses a converter (Page 2, lines 13-20) mounted in a plasma source, for generating negative ions by surface ionization of positive ions and that is negatively biased with reference to plasma and ion source walls.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use converter as taught by admitted prior art in the apparatus of Leung et al to generate negative ions.

Regarding Claim 4: Leung et al teach that the plasma generated in the source chamber is an argon ion plasma (Column 4, lines 27-30).

Regarding Claim 8: Leung et al teach (Column 4, line 66 to Column 5, lines 1-5) that the source chamber 42 further comprises:

an extraction aperture 62;

a pair of spaced extraction electrodes 64, 66 (Figure 8) mounted at the aperture.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Delmore (US Patent 4,649,279) teaches a negative ion source (Figure 1) using electron capture process in which particles of incoming gas upon capturing one or more electrons become negative ions 20 and travel in direction of arrow 22, in the direction of application or instrument requiring negative electrons.

Tokoro et al (US Patent No. 5,162,699) teach an ion source (Figures, 2, 3) that uses a boron compound (LaB.sub.6) component 21, 22 at a suitable location inside the arc chamber and operates on the principle of ion production using hot cathode to produce hot electrons and increase yield of boron ions. (Abstract, Column 2, lines 55-60 and Column 3, lines 1-5).

Chen et al (US Pub. No. 2002/0072016) Chen et al teach a plasma apparatus (Figure 2, 3) that operates at RF power level of 200-2000 W to reduce the need to expose the substrate to a wet solvent (Paragraphs 0007, 0030).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh Dhingra



Parviz Hassanzadeh
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